



Department of Pesticide Regulation



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MEMORANDUM

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HSM-16003

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DATE: July 28, 2016

SUBJECT: SIMAZINE MITIGATION SCOPING DOCUMENT

Attached is a mitigation scoping document for registered pesticide products containing simazine as an active ingredient. All actively registered labels (currently a total of 9) were reviewed, as well as pesticide use data, pesticide illness data, and other pertinent information. Based on this information, this document is intended to lay the groundwork for the mitigation process in the event that the Department of Pesticide Regulation's (DPR) Executive Office determines mitigation is needed for simazine.

If you have any comments or questions, please contact me at the number listed above.

Attachment



California Environmental Protection Agency

Department of Pesticide Regulation
Worker Health and Safety Branch

HSM-16003

SIMAZINE
MITIGATION SCOPING DOCUMENT
July 2016

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I. Summary

Simazine is a selective pre- and post-emergence herbicide for the control of broadleaf and grassy weeds in soil where almonds, apples, avocados, blueberries, established Christmas trees, grapes, nectarines, olives, pears, pecans, strawberries, and other crops will be planted or are planted, and in non-cropped areas such as around buildings, lawns, and rights-of-way. Simazine's mode of herbicidal action is through inhibition of photosynthesis.

The reported use of simazine in California averaged 378,001 pounds (lbs) of active ingredient (AI) per year from 2009 to 2013. The major use crops were: almonds, avocados, grapes, oranges, and walnuts. There is some additional non-agricultural use for turf, landscape, and ornamental weed control.

Illness report records for 2011-2013 reported one illness as associated with simazine in 2012. This exposure occurred while an applicator was applying diquat and simazine in a nursery with a ground rig, and resulted in the worker experiencing dizziness, nausea, and vomiting. DPR's Risk Characterization Document (RCD), published in 2013, covers illness report records for 2006-2010, which reported one illness associated with simazine in 2006.

Based on the information on the product labels, exposure scenarios were evaluated by DPR's Human Health Assessment (HHA) Branch for agricultural, commercial, and non-agricultural handlers, as well as bystanders and residents. The RCD compiled by HHA identified margins of exposure (MOEs) below 100 for the majority of the handler and agricultural use scenarios, as well as MOEs below 300 for residents and bystanders exposed to treated turf. The summary information in this scoping document is intended to aid in the mitigation process if DPR determines mitigation is needed.

II. Purpose

During the risk assessment process, DPR evaluates current pesticide use practices, chemical toxicity, and the potential for adverse effects associated with a given pesticide, and determines if action is needed to further reduce the risk of exposure. DPR prioritized simazine for risk assessment because simazine and its metabolites were found in California ground water (Silva, 2013).

This scoping document establishes the groundwork for potential mitigation development by reviewing the exposure scenarios relevant to California and their respective MOEs, as well as the protective measures identified on currently registered pesticide labels. The synthesis of this information can then be used for the development of mitigation measures for simazine, if needed.

III. Regulatory History / Status

Simazine is registered by the United States Environmental Protection Agency (U.S. EPA) as an herbicide. In April 2006, the U.S. EPA finalized their Reregistration Eligibility Document (RED) for simazine and the triazine family of pesticides which resulted in proposed mitigation including: changes in formulations, prohibition of aerial applications, reductions in application rates, increased personal protective equipment (PPE), and an increased restricted entry interval (REI) for Christmas trees.

Simazine was first registered for use in California in 1981. In 2013, DPR completed a RCD addressing the potential risk to human health as a result of application, dietary, and drinking water exposure to simazine (Silva, 2013).

The California regulatory status for Simazine is summarized below (Table 1).

Table 1: California Regulatory Status

	Restricted Material	Toxic Air Contaminant	Groundwater Protection List	Proposition 65 List
Yes / No	Yes (products labeled for agricultural, outdoor institutional, or outdoor industrial use)	No	Yes	No
Laws	FAC Division 7, Chapter 3, Article 1, Section 14001	FAC Division 7, Chapter 3, Article 1.5, Section 14021(b)	FAC Division 7, Chapter 2, Article 15, Section 13141	Health & Safety Code, Section 25249.5
Regulations	3 CCR, Sections 6400 (d)	3 CCR, Section 6860	3 CCR, Section 6800, 6487.1-6487.5	27 CCR, Section 25000 to 27001
FAC: California Food and Agricultural Code HSC: California Health and Safety Code CCR: California Code of Regulations				

IV. Pesticide Use and Sales

California pesticide use reports show simazine is predominantly used on soil where tree/vine crops are planted or will be planted. Use is allowed in non-agricultural settings, however it is not as distinctively captured in DPR's pesticide use report database as agricultural use due to differences in reporting requirements.

Available California pesticide use reports for the past five years (2009-2013) indicate a total of 1,890,005 lbs of simazine AI was applied with the majority of applications occurring from November through March during which time simazine is most effective as a pre-emergent herbicide (Figure 1). The average annual use was 378,001 lbs AI and the average annual amount sold was 553,459 lbs AI. This imbalance between pesticide use and pesticide sales is possibly due to non-agricultural use sales resulting in additional applications which are not as distinctly reported in California's pesticide use reporting system. Almonds, avocados, grapes, oranges, and walnuts were the major use crops constituting 82 percent of the total amount applied (Table 2). The five counties with highest reported use of simazine during 2009-2013 were Fresno, Kern, Madera, San Joaquin, and Tulare, collectively constituting 65 percent of the total pounds of simazine active ingredient applied in the five year period (Table 3).

Figure 1: Average Pounds of Simazine AI Applied by Month for 2009-2013

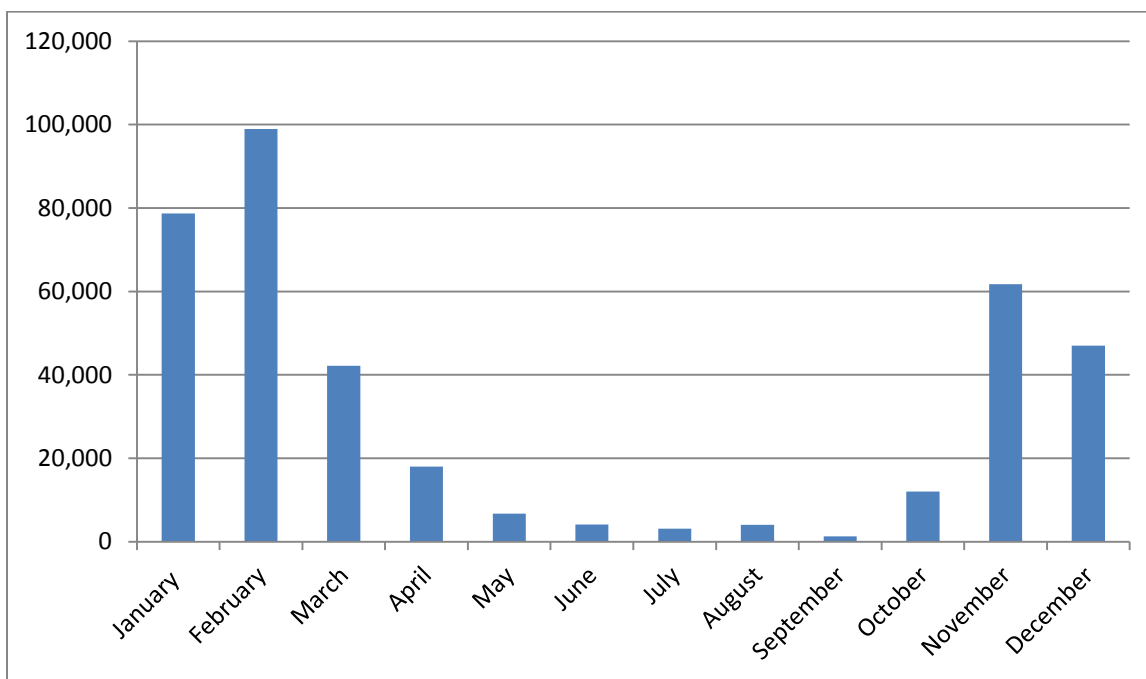


Table 2: Pounds of Simazine AI applied by crop in California for 2009-2013

Commodity/Site	2009	2010	2011	2012	2013
Orange	139,193	136,397	128,450	113,548	72,026
Grape (Wine)	89,794	67,764	94,442	74,329	80,018
Grape	46,318	47,972	50,635	39,255	40,785
Almond	48,349	36,975	46,209	37,378	30,741
Walnut	33,795	35,236	34,924	35,805	32,742
Avocado	9,790	12,877	18,332	16,771	12,099
Olive	10,272	8,069	15,242	11,465	7,072
Lemon	7,346	10,526	12,001	10,535	7,499
Rights of Way	12,400	5,468	8,471	13,394	5,938
Landscape Maintenance	7,734	3,709	3,465	2,443	1,547
Grapefruit	2,492	4,381	2,841	2,284	1,398
Peach	1,860	2,354	1,134	1,046	529
Other Crops	620	2,390	956	1,338	1,356
Pear	908	1,004	1,672	982	1,123
Blueberry	311	870	2,679	523	617
Tangerine	184	16	1,281	865	752
Uncultivated Non-Ag	721	591	324	331	593
Nectarine	1,256	389	397	128	187
Apple	181	402	658	76	217
Uncultivated Ag	843	203	64	112	109
Structural Pest Control	78	15	61	199	420
Citrus (unspecified)	111	178	78	167	105
Cherry	316	107	72	4	23
Pecan	77	88	56	55	109
Corn	180	48	50	24	
Lime		26	66		111
Christmas Tree	10	19	49		
Total	415,136	378,072	424,718	363,057	298,113

Table 3: Pounds of Simazine AI applied by the Top 5 Counties with Highest Use in California for 2009-2013

County	2009	2010	2011	2012	2013
Tulare	106,999	86,693	91,439	76,420	46,651
Fresno	64,424	64,702	59,176	51,039	47,555
Kern	53,555	62,138	60,403	60,662	49,880
San Joaquin	29,072	22,409	36,109	22,793	21,648
Madera	29,296	19,399	29,090	20,493	18,132

V. Products and Formulations

As of July 2016, there are 9 products containing simazine as the active ingredient registered in California (Table 4) and one Special Local Needs 24(c) (SLN) registration to allow for application through micro sprinklers in citrus groves (Table 5).

Table 4: Simazine Products Registered in California

Name	Formulation	Registration No.	Percent Active Ingredient	Registrant
Drexel Simazine 4L	Flowable Concentrate	19713- 60-AA	40.0	Drexel
Princep 4L	Flowable Concentrate	100- 526-ZG	41.9	Syngenta
Princep Caliber 90	Dry Flowable	100- 603-ZC	90.0	Syngenta
Princep Liquid	Flowable Concentrate	100- 526-ZF	41.9	Syngenta
Sim-Trol 4L	Flowable Concentrate	35915- 11-AA	42.8	Oxon Italia
Sim-Trol 4L	Flowable Concentrate	35915- 11-AA-60063	42.8	Sipcam Advan
Sim-Trol 90 DF	Dry Flowable	35915- 12-AA-60063	90.0	Sipcam Advan
Sim-Trol 9DF	Dry Flowable	35915- 12-AA	90.0	Oxon Italia
Simazine 90 DF	Dry Flowable	19713- 252-AA	90.0	Drexel

Table 5: Special Local Needs (24 (c)) Registrations for Simazine

Product	Special Local Need No.	Commodity	Pest Species
Princep 4L	CA-050004	Citrus	Various Weed Species

VI. Label Requirements

Simazine is approved for agricultural and non-agricultural use. All 9 simazine products registered in California are listed as Category III “Caution” products. In 2006, the U.S. EPA RED required changes in formulations, prohibition of aerial applications, reductions in application rates, increased PPE, and an increased REI for Christmas trees. HHA did not include these changes in their calculations in the RCD. Subsequent to the changes required by the U.S EPA RED and during the development of this scoping document, it was determined that all of the labels listed in Table 4 comply with the changes listed above except for Sim-Trol 9 DF (product registration number 35915- 12-AA) and Sim-Trol 4L (product registration number 35915- 11-AA). All products can be applied via ground application and in Fresno and Tulare Counties, Princep 4L is allowed to be applied through micro-sprinkler irrigation in accordance with SLN 24(c) CA-050004.

There are several label restrictions to avoid environmental damage to non-target groundwater and nearby surface water bodies when simazine products are applied. These include buffer zones for mixing, loading, and application near bodies of water, restrictions in areas with permeable soil types, setbacks from wells, and a prohibition on aerial application. Additionally, simazine has spray drift restrictions including not applying in wind speeds over 10 mph, applying as a coarse or coarser spray (ASABE standard 572¹), and not applying via ground with a nozzle height above 4 feet from the ground or crop canopy. When handling simazine the label requires the following PPE:

Mixers, loaders, applicators, and handlers handling dry flowable products, and all handlers of liquid products are required to wear the following PPE:

- Long-sleeve shirt and pants
- Shoes plus socks
- Chemical resistant gloves

When mixers and loaders are handling dry flowable products in support of groundboom applications they are required to wear the following PPE:

- Coveralls over long-sleeve shirt and pants
- Chemical resistant footwear and socks
- Chemical resistant gloves
- Chemical resistant apron
- And a NIOSH approved respirator with a dust/mist filter (with MSHA/NIOSH approval number prefix TC-21C or with any N, R, P, or HE filter)

When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [Code of Federal Regulations, title 40, section 170.240(d)(4-6)], the handler PPE requirements may be modified as specified in the WPS.

Label rates for most crops vary from 0.6 to 4 lbs AI per acre (A) with a maximum application rate of 6 lbs AI per A, per calendar year, for turfgrass on sod farms. The labels allow 1 to 2 applications per year (Table 6).

Table 6: Pounds of Simazine AI Allowed for the Top 5 Major Use Crops in CA

Crop	Pounds of AI per Application	Pounds of AI per Year
Almonds	1-2	2
Avocados	2-4	4
Grapes	2-4	4
Oranges	2-4	4
Walnuts	2-4	4

¹ ASABE Standard 572 can be referenced online at “<http://www.asabe.org/standards.aspx>”

Simazine has a REI of 12 hours for all agricultural uses with the exception of Christmas trees which have an REI of 48 hours. Early entry workers are required to wear coveralls, shoes plus socks, and chemical resistant gloves made of any waterproof material. Non-agricultural use products restrict entry into treated areas until sprays have dried.

Simazine has a preharvest interval (PHI) of 45 days to 60 days for sweet and field corn, respectively, and a PHI of 150 days for apples. All other uses of simazine do not specify a PHI.

VII. Potential Exposure Scenarios

Simazine products are available for agricultural and non-agricultural use. Given this information, the simazine exposure scenarios are grouped as follows:

1. Agricultural applicators only;
2. Agricultural mixer/loaders only;
3. Agricultural mixer/loader/applicators (who do all three tasks in one application event);
4. Non-agricultural mixer/loader/applicators; and
5. Bystander/resident exposure to treated soil and treated turf.

Simazine is applied as a pre-emergent herbicide to the soil; therefore, DPR does not have worker exposure concerns related to workers reentering a treated area after the REI has expired due to the low probability for significant contact with previously treated soil (Silva 2013).

DPR bases the majority of their risk assessments on the results of tests conducted on laboratory animals. In order to account for the uncertainty inherent in using the results of animal studies, DPR applies uncertainty factors which are determined by the completeness of the study data and species extrapolation. These uncertainty factors are used to calculate the MOE based on the potential human exposure scenarios identified by DPR.

Handler Exposure Scenarios

In the case of simazine, an MOE of 100 was based on a 10x uncertainty factor for interspecies sensitivity and a 10x factor for intraspecies variation. Table 7 details the MOEs calculated for simazine handlers for acute, seasonal, annual, and lifetime exposure as well as their corresponding aggregate values which include the potential for dietary exposure. However, these values do not reflect changes made by the U.S. EPA in 2006 which included: changes in formulations, prohibition of aerial applications, reductions in application rates, increased PPE, and an increased REI for Christmas trees.

Table 7: Margins of Exposure for Simazine Handlers^a

Application Method and Formulation	Acute MOE	Aggregate ^b Acute MOE	Seasonal MOE	Aggregate ^b Seasonal MOE	Annual MOE	Aggregate ^b Annual MOE	Lifetime MOE	Aggregate ^b Lifetime MOE
<i>Applicators (Agricultural Use)</i>								
Liquid Groundboom	34	33	15	15	84	82	997	849
<i>Occupational Mixer/Loaders (Agricultural Use)</i>								
Liquid Groundboom	5	5	3	3	14	14	145	142
Liquid Chemigation	2	2	1	1	6	6	60	60
Dry Flowable Groundboom	14	14	6	6	34	34	363	345
<i>Occupational Mixer/Loader/Applicator (Agricultural Use)</i>								
Flowable Low-Pressure Sprayer	147	140	73	70	400	331	4,143	2,603
Flowable High-Pressure Sprayer	5	5	1	1	8	8	806	722
Flowable Backpack Sprayer	9	9	3	3	16	16	171	167
<i>Occupational Mixer/Loader/Applicators (Non-Agricultural Use)</i>								
Flowable Low-Pressure Sprayer	373	328	184	169	1,000	659	10,357	4,179
Flowable High-Pressure Sprayer	12	12	14	3.5	19	19	207	201
Flowable Backpack Sprayer	21	21	29	7	40	39	42	42
<i>Homeowner/Resident Mixer/Loader/Applicator (Non-Agricultural Use)</i>								
Flowable Low Pressure Sprayer	1,852	496	NA ^c	NA ^c	NA ^c	NA ^c	NA ^c	NA ^c

^a Bolded values indicate a MOE below 100

^b Aggregate MOE = MOE + dietary exposure

^c NA: Not applicable, long term exposure not expected

Resident/Bystander Exposure Scenarios

For exposure to bystander/residents an MOE of 300 was based on a 10x uncertainty factor for interspecies sensitivity, a 10x factor for intraspecies variation, as well as a 3x uncertainty factor based on insufficient data relating to the neuroendocrine effects on reproduction and development and concern for children with pica who consume non-nutritive substances and tend to have a larger oral intake of soil. Table 8 details the MOEs calculated for residents and bystanders for acute, seasonal, annual, and lifetime exposure to treated turf and soil, as well as their corresponding aggregate values which include the potential for dietary exposure. The majority of these values are below 300, indicating the potential for human health concerns related to exposure in the specified scenario.

Table 8: Margins of Exposure for Residents and Bystanders to Simazine^a

Route and Medium	Acute MOE	Aggregate ^b Acute MOE	Seasonal MOE	Aggregate ^b Seasonal MOE	Annual MOE	Aggregate ^b Annual MOE	Lifetime MOE	Aggregate ^b Lifetime MOE
<i>Treated Turf</i>								
Dermal Contact	83	78	14	14	78	65	5,471	3,072
Hand-to-Mouth	71	68	12	12	67	57	4,677	2,804
<i>Treated Soil</i>								
Dermal Uptake	8,333	1,106	933	297	5,200	377	290,000	6,840
Oral Intake	2,273	385	255	161	1,444	317	96,667	6,531
Oral Intake Pica ^d	33	32	5	5	29	27	1,933	1,797
<i>Total^c</i>	38	37	6	6	37	34	2,416	1,796
<i>Total^{cd} (with pica)</i>	33	32	5	5	29	27	1,933	1,515

^a Bolded values indicate a MOE of concern (below 300)

^b Aggregate MOE = MOE + dietary exposure

^c Total Absorbed Dose for each given interval = [(MOE from turf dermal contact) + (MOE from turf hand-to-mouth) + (MOE from soil dermal uptake) + (MOE from soil oral intake)]; for aggregate the dietary values are added and this sum divided by the appropriate NOEL.

^d Potential effects to children with pica who have increased oral intake of simazine on treated soil.

VIII. Pesticide Illness Reports

Reports of illnesses and injuries associated with exposure to pesticide products are maintained in DPR's Pesticide Illness Surveillance Program (PISP) database. According to DPR's RCD reported illnesses associated with simazine between 2006 and 2010, one illness was reported to PISP as probably related to simazine use in combination with other pesticides. The case involved a mixer/loader (from use in a vineyard in 2006) experiencing eye irritation as the only symptom. From 2011 to 2013 there has been only one incident reported to PISP in 2012. This incident was classified as possibly associated with simazine. In this incident an applicator was applying diquat

and simazine together at a nursery with a ground rig, experienced symptoms of dizziness, nausea, and vomiting, and was subsequently taken for medical care.

In support of publication of the U.S. EPA RED for simazine and the triazine family of pesticides, the U.S. EPA published “Atrazine, Propazine and Simazine: Review of Human Incidents” in 2013. This report summarizes human exposure incidents across the nation, including the California incidents reported in PISP.

IX. References

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